TS 2004 Workshop

Airfield Design Solutions

2 April 2004

USACE Transportation Systems Center

B. J. Skar

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Introduction

- Airfield Criteria Review
- PCC Jointing
- Joint Sealing
- Design Essentials

DOD Airfield Criteria Review

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Latest Criteria Outline.doc

PCC Jointing Discussion

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PCC JOINTING

- Why Plain Jointed PCC
- Why Joint PCC
- Joint Spacing
- Load Transfer
- Joint Types

Why Plain Jointed PCC

(PCC JOIINTING)

- **Experience/Repairs**
- **Least Cost Life Cycle**
- **UFC 3-260-02 requires it**

Why Joint PCC

(PCC JOIINTING)

- **Heat of Hydration (shrinkage)**
- **Water loss (shrinkage)**
- **Curling (temp differential)**

Joint Spacing

(PCC JOIINTING)

- **Volumetric shrinkage uniform**
- **Cracks form in square pattern**
- **Experience shows related to thickness**
- **Table 7, UFC 3-260-02 (page 12-21)**
- **Old criteria and 25 foot slabs**

Load Transfer

(PCC JOIINTING)

- **What is load transfer?**
- **Why require load transfer?**
- **How is it provided?**
- **When is ok to not provide it?**

Joint Types

(PCC JOIINTING)

- **Contraction**
- **Construction**

Joint Types

(Contraction)

- Sawn
- Inserts (not used on airfields)
- Tied (not used on airfields)
- Doweled

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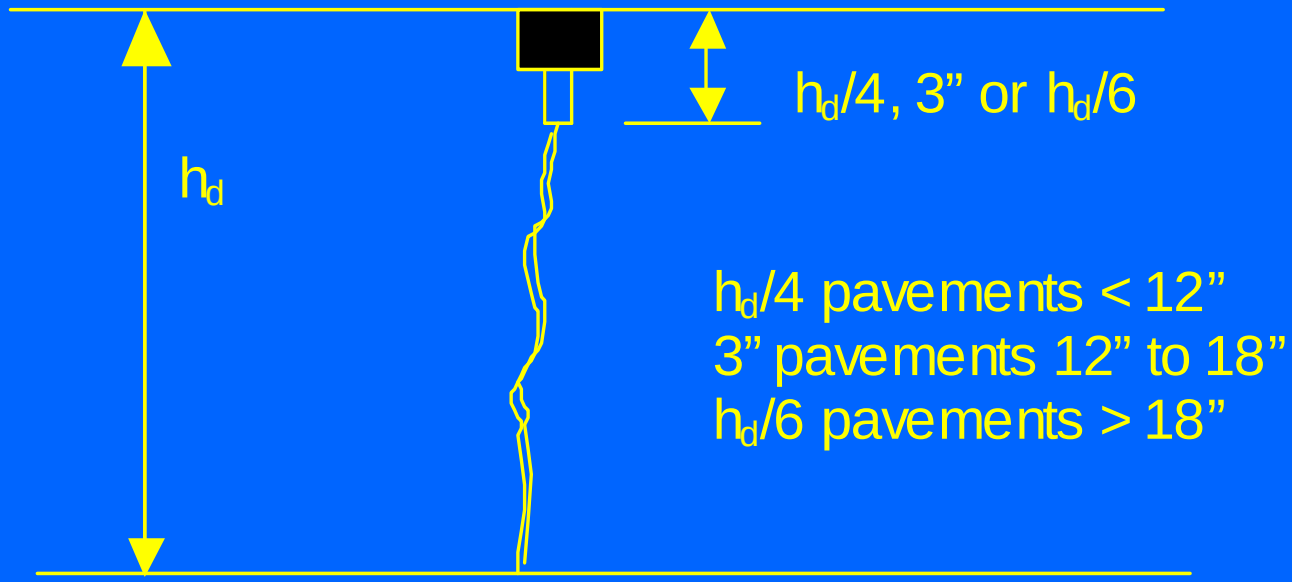
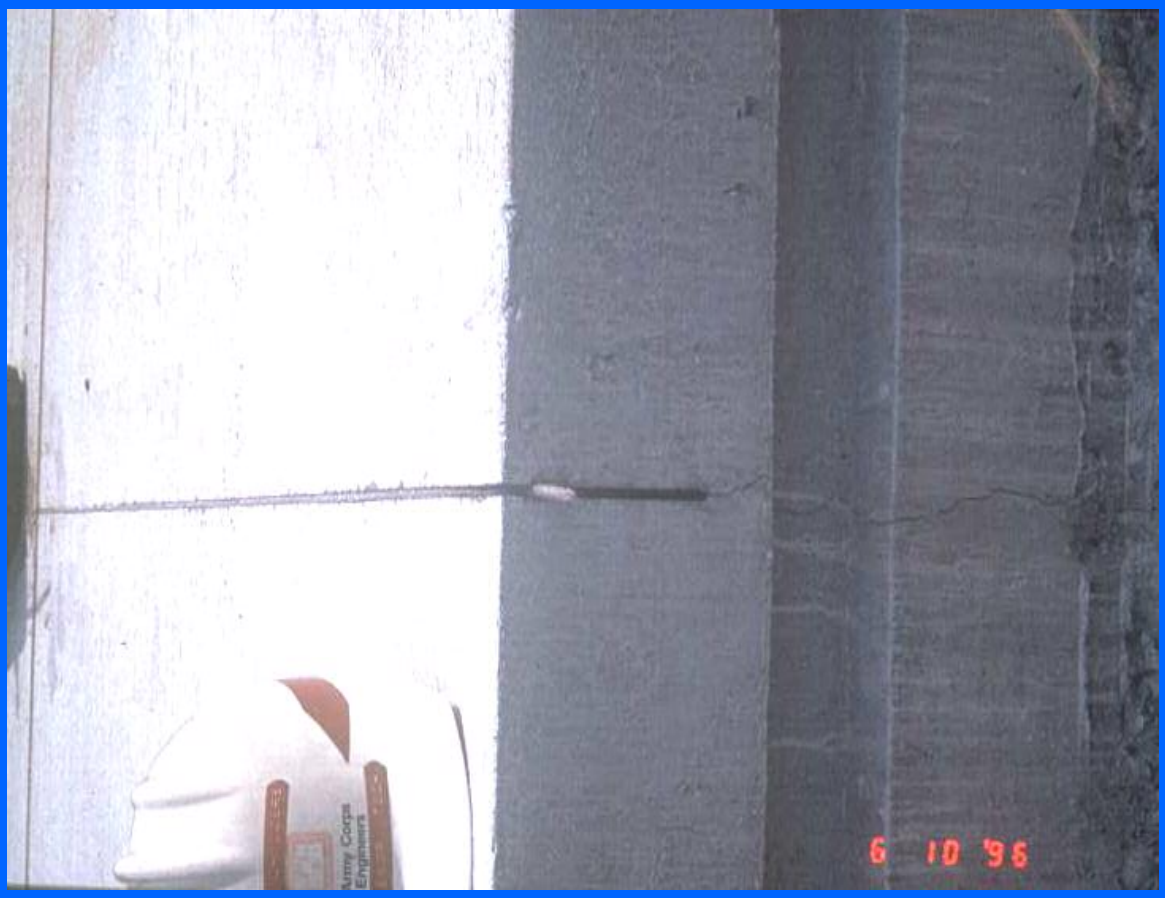
Joint Types

Sawn Contraction




Army Corps
Engineers
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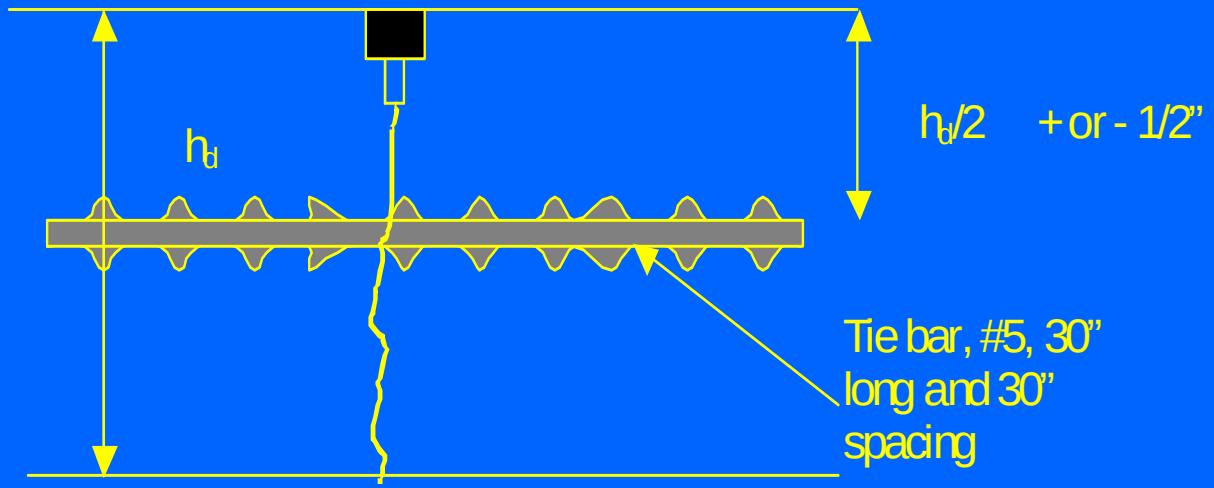
Joint Types

Tied Contraction



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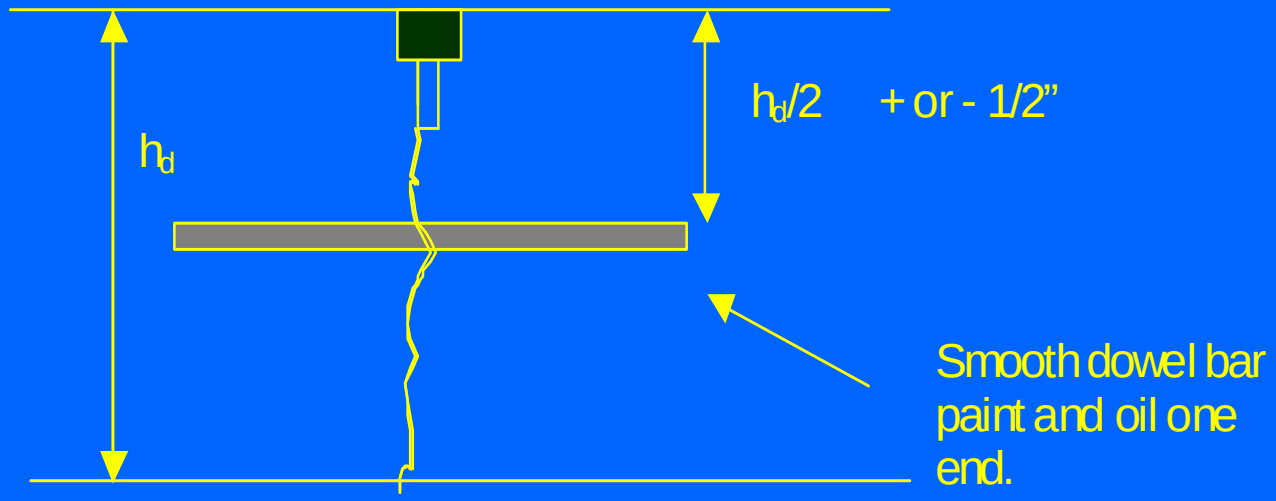
Joint Types

Doweled Contraction



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Joint Types

(Construction)

- Butt Joint
- Doweled Joint
- Thickened Edge Joint
- Tied

Joint Types

(Construction Butt)

- Plain
- Expansion
- Slip?

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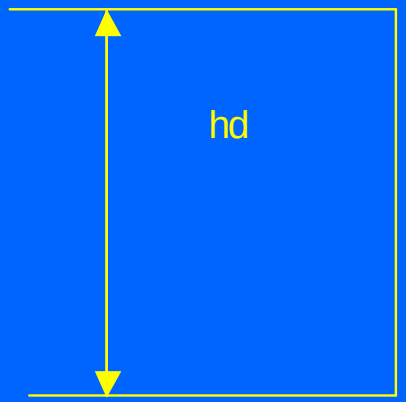
Joint Types

(Construction Plain Butt)



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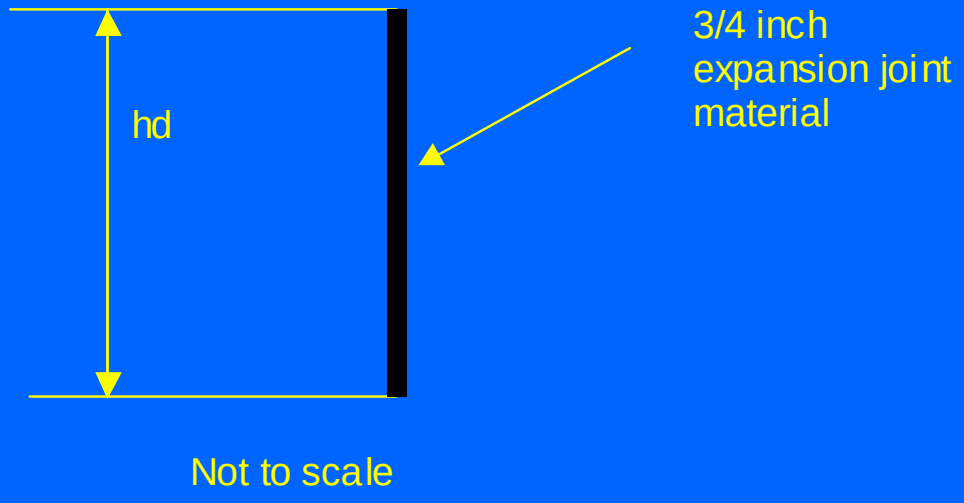
Joint Types

(Construction Butt Expansion)



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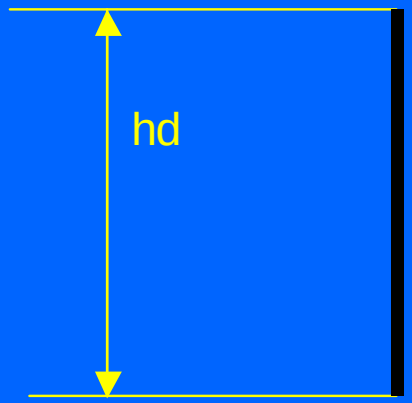
Joint Types

(Construction Butt Slip?)



1//16 inch if joints line up, 1/4 inch if joints don't line up.

Not to scale

Joint Types

(Construction Doweled)

- Doweled Plain
- Doweled Expansion
- Doweled Different Thickness

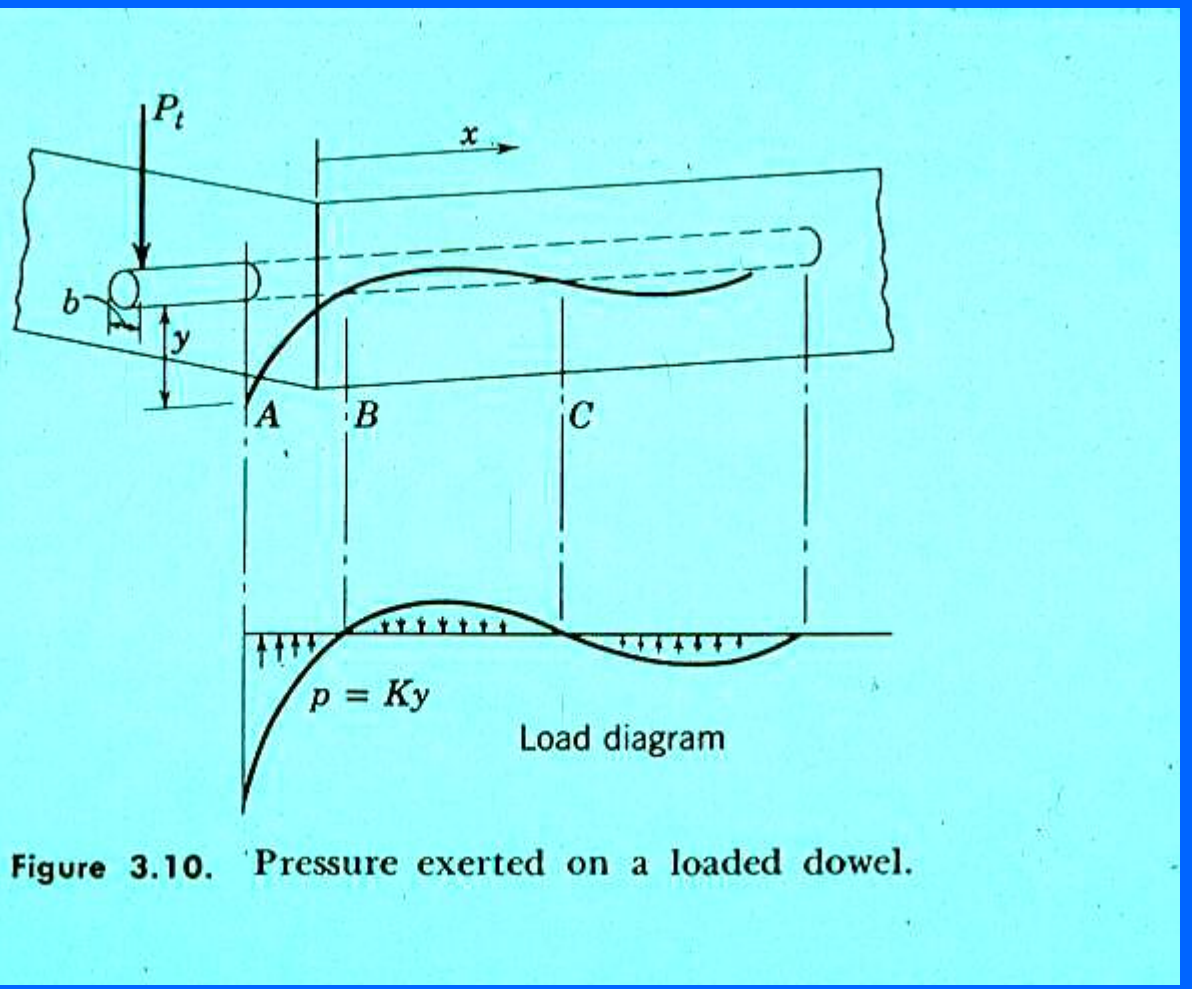


Figure 3.10. Pressure exerted on a loaded dowel.

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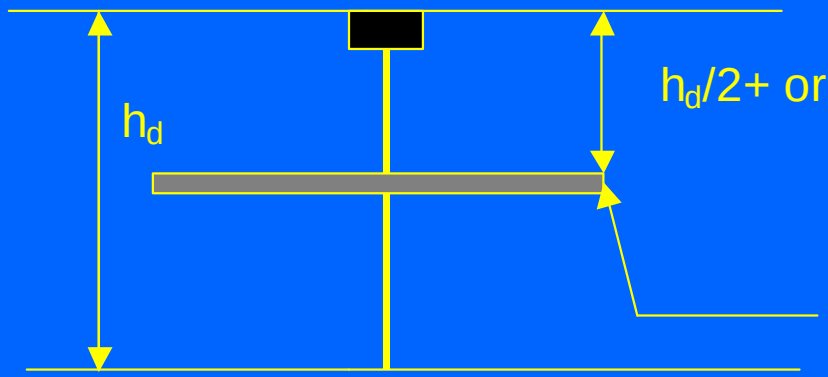
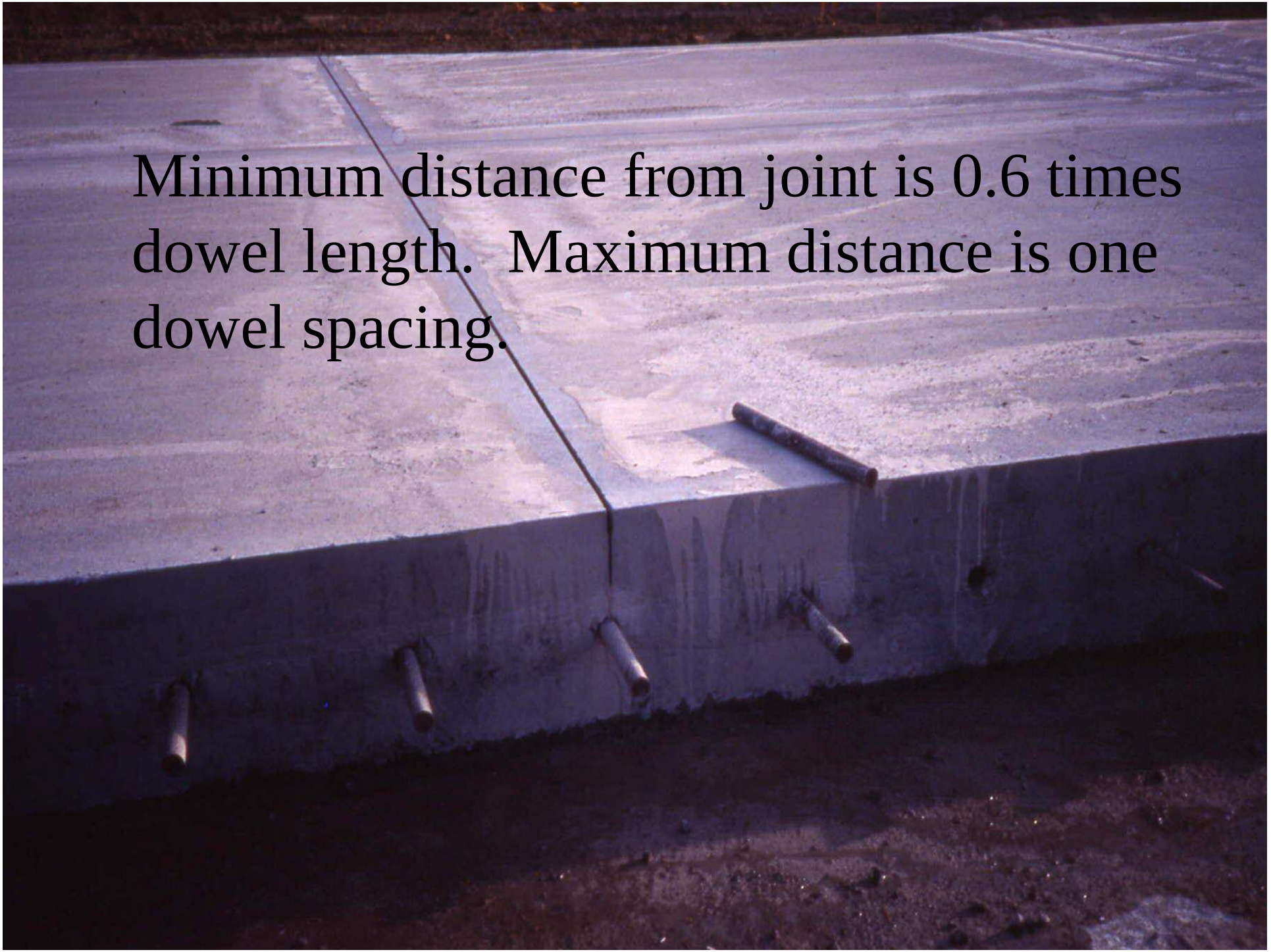
Joint Types

(Construction Doweled Plain)

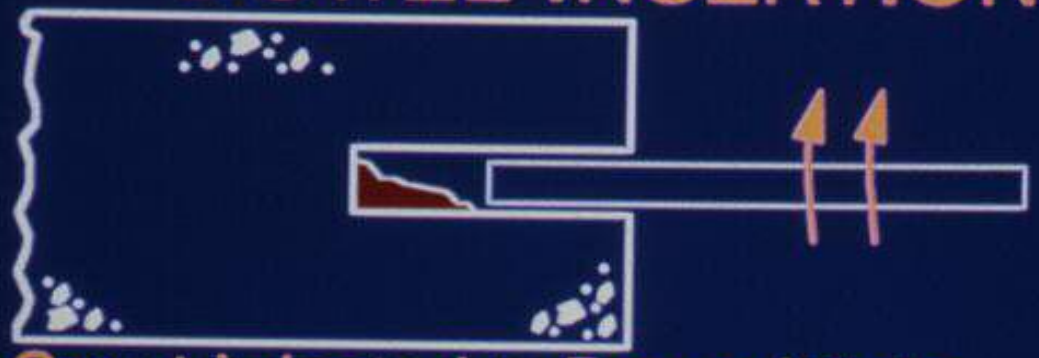


Doweled Construction

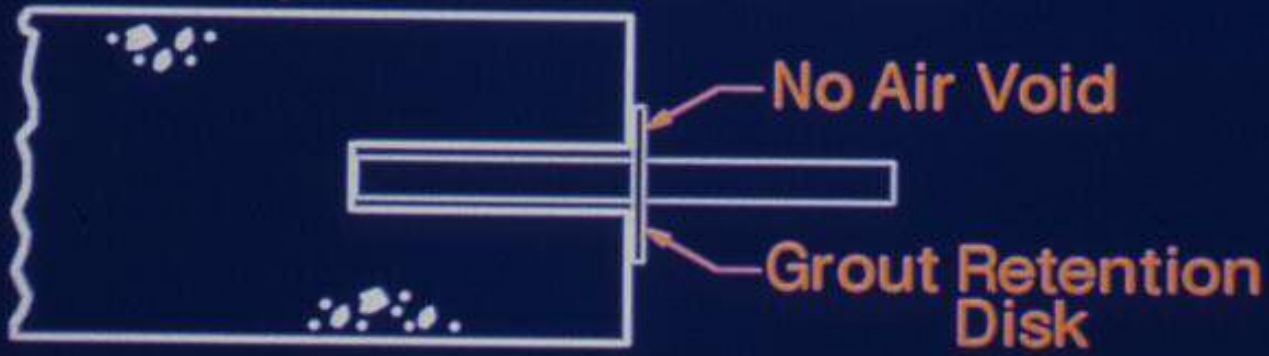
- Dowel Size
- Table 12-8
- UFC 3-260-02
- Based on Pavement Thickness


Minimum distance from joint is 0.6 times dowel length. Maximum distance is one dowel spacing.

PROPER GROUTING & DOWEL INSERTION



Grout Injected to Rear of Hole

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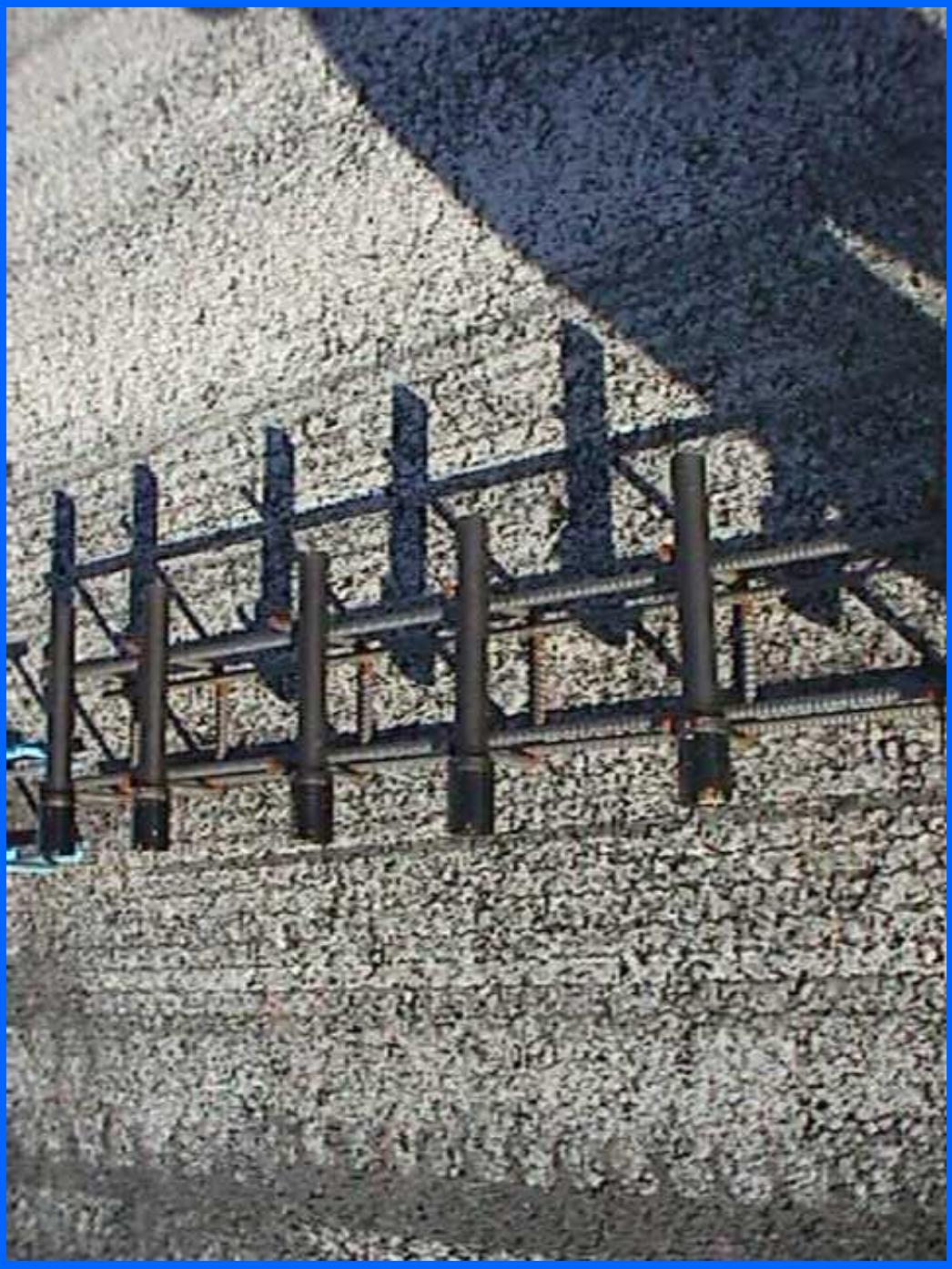

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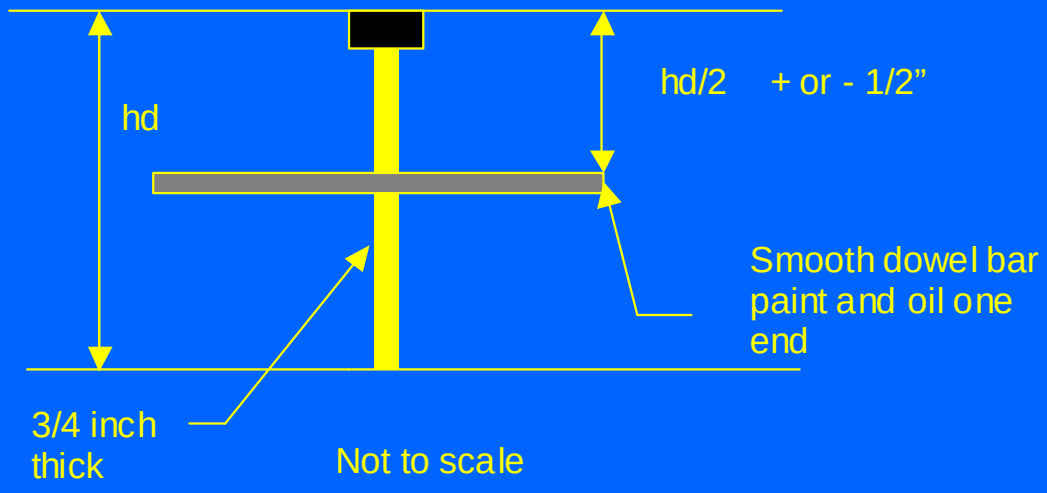
Joint Types

(Construction Doweled Expansion)



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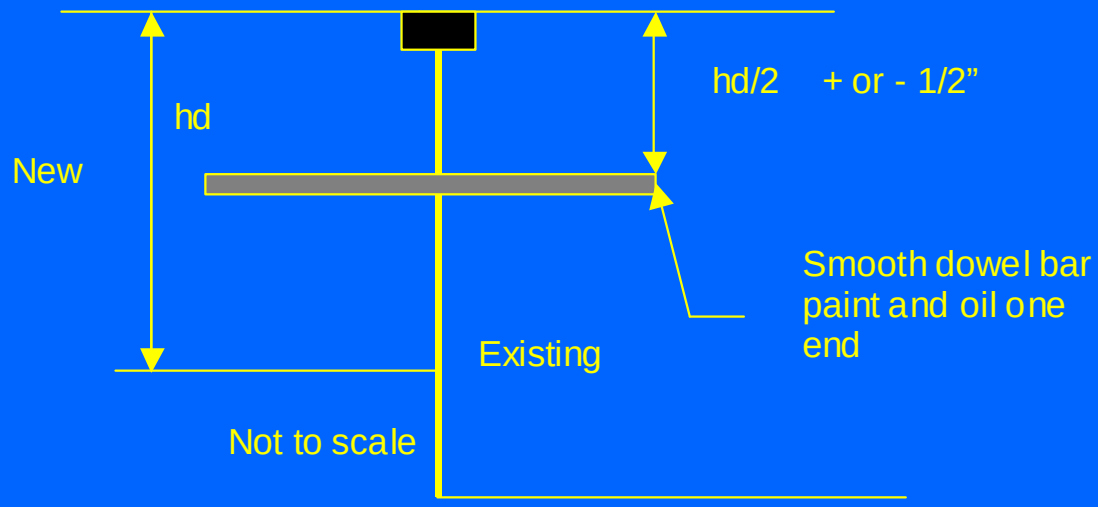
Joint Types

(Construction Doweled Different Thickness)



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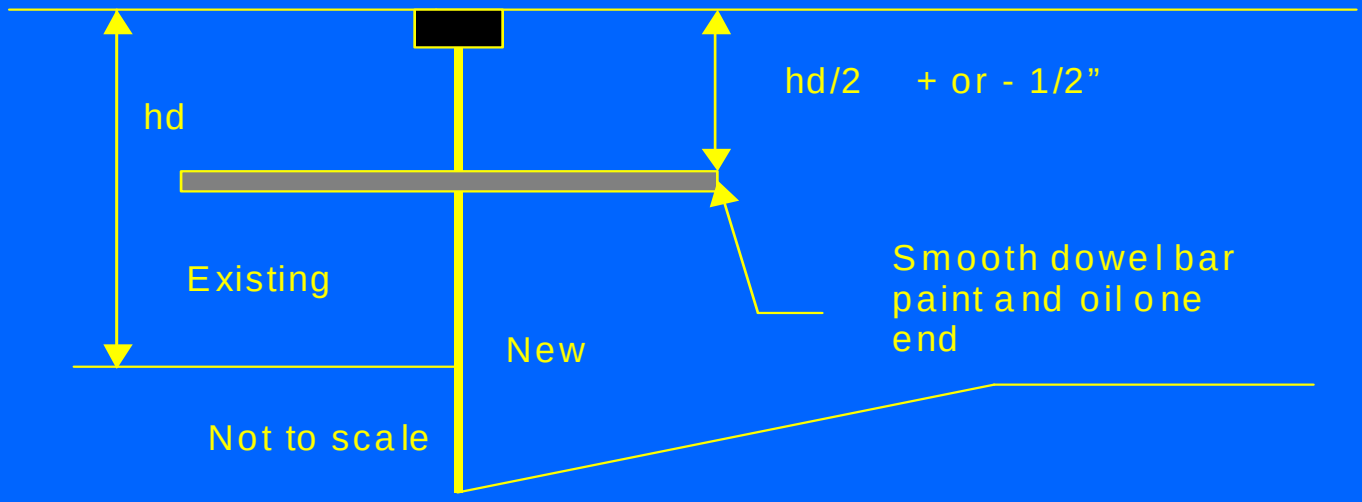
Joint Types

(Construction Doweled Different Thickness)



Joint Types

(Thickened Edge Joint)

- Plain
- Expansion
- Slip

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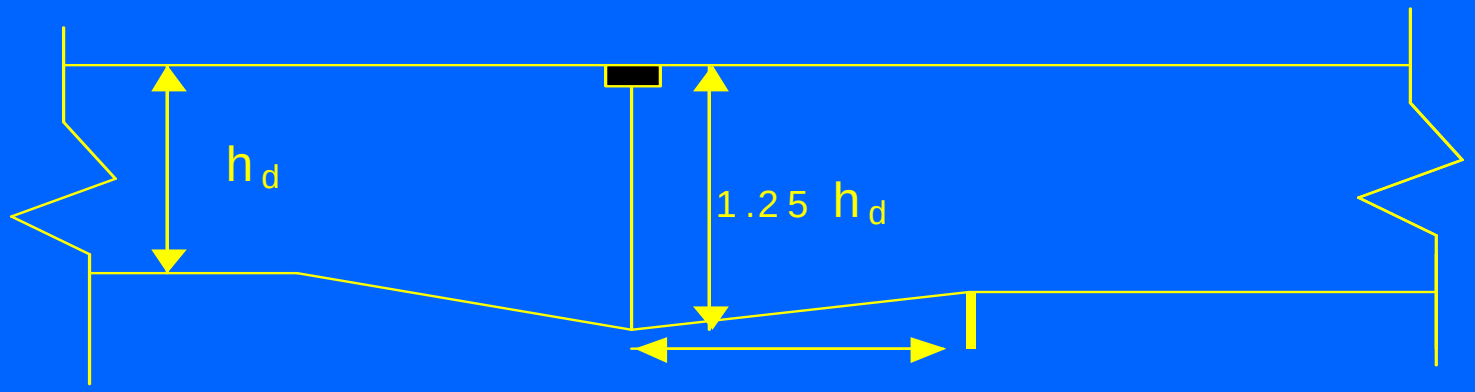
Joint Types

(Construction Thickened Edge Plain)



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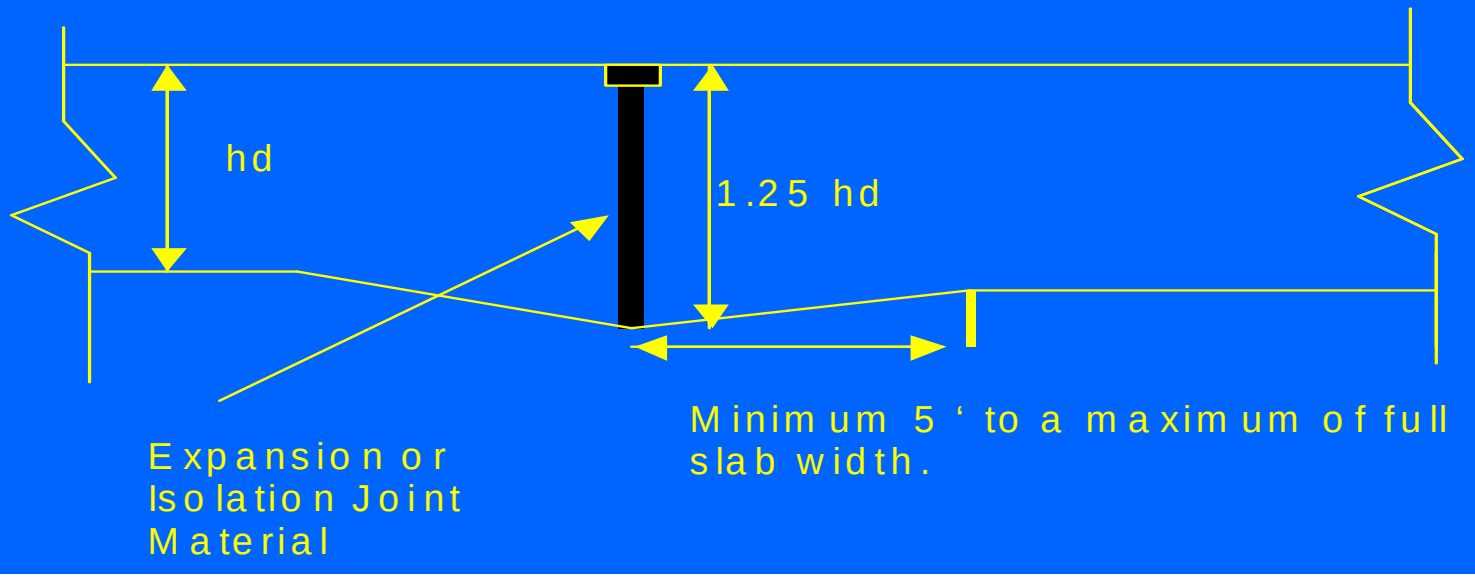
Joint Types

(Construction Thickened Edge Expansion)



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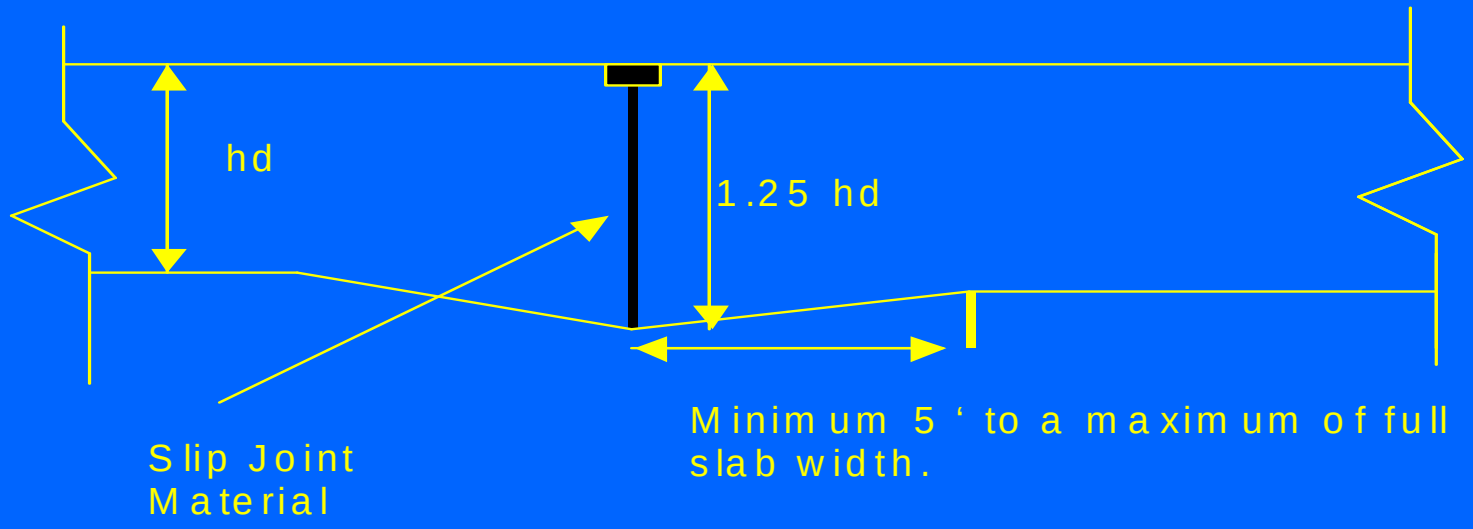
Joint Types

(Construction Thickened Edge Slip)



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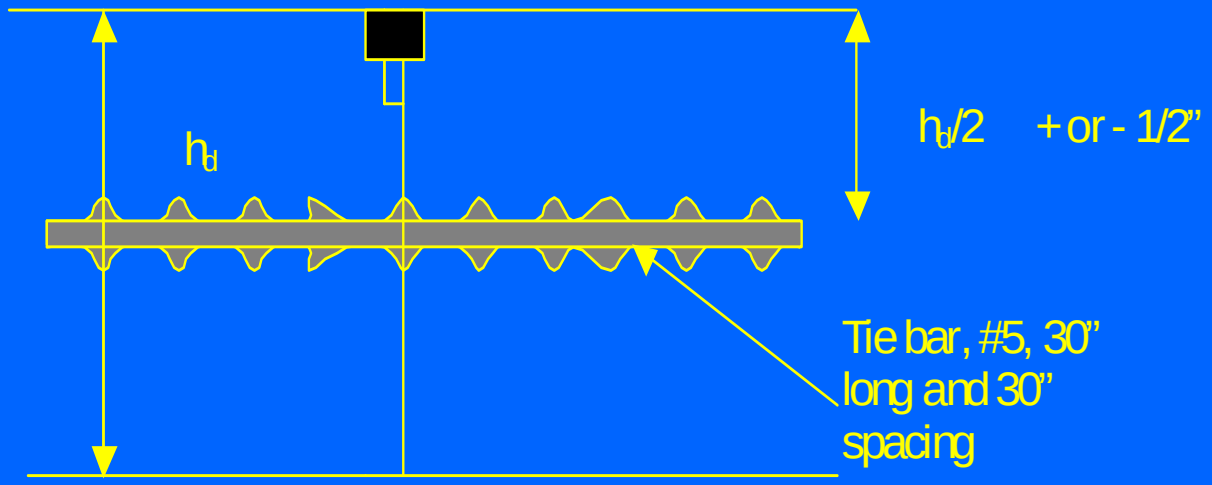
Joint Types

Tied Construction



Not to scale

Jointing Plans

- Grades
- Large Pavement Penetrations
- Small Pavement Penetrations
- Connecting Pavements
- Filets/Odd Shaped Slabs

Jointing Plans

(Grades)

- Construction joints can have continuous changes
- Slabs must not have a crown or sag between construction joints

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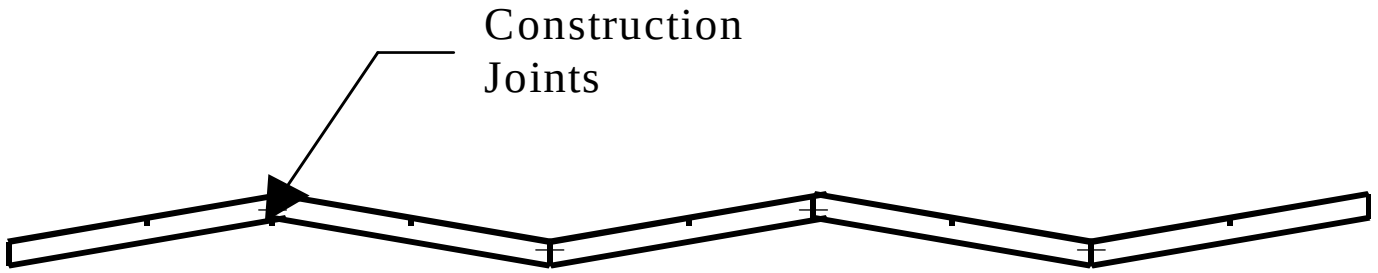
Jointing Plans



Contraction Joint Profile

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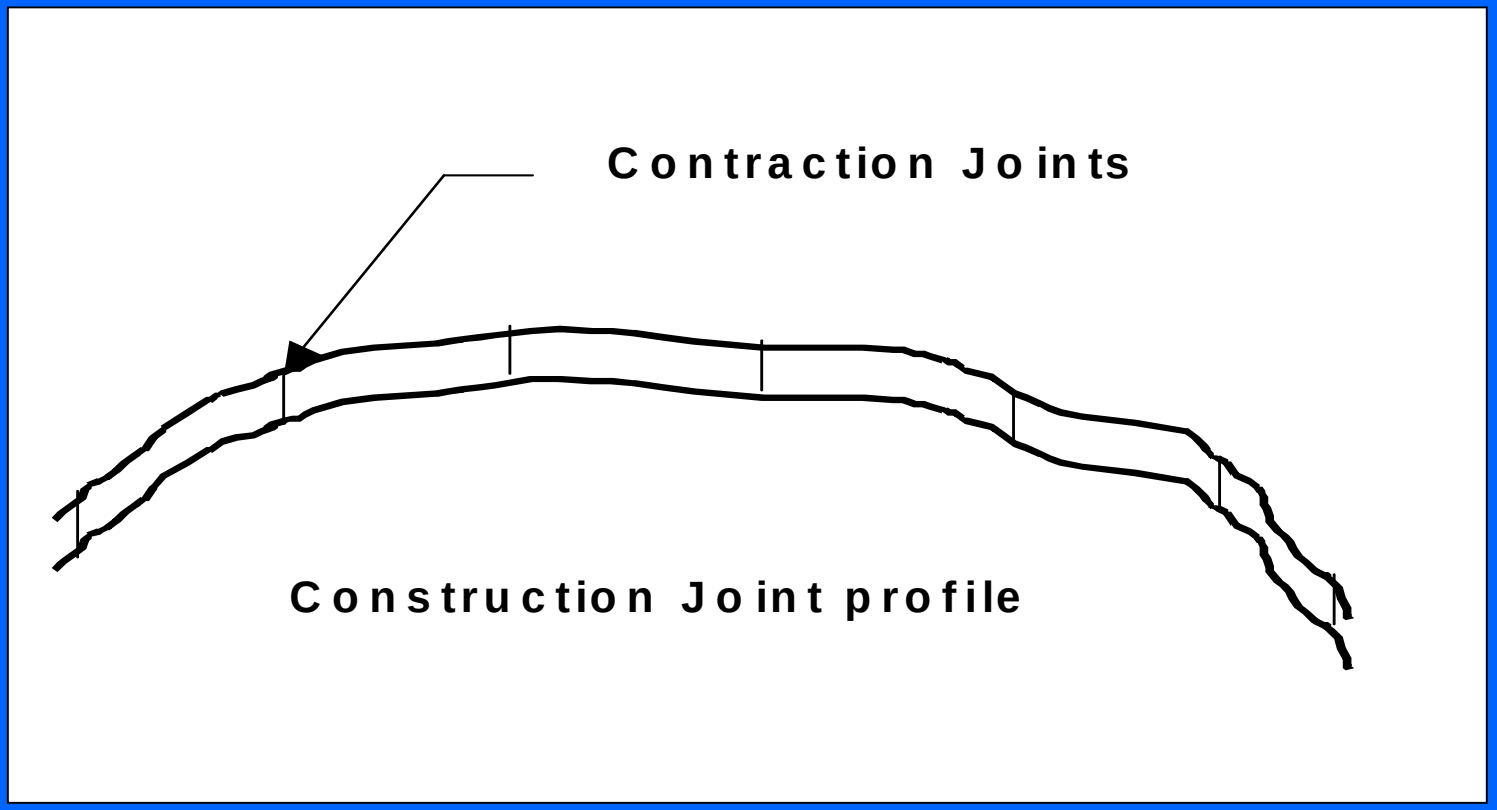
Joint Plans



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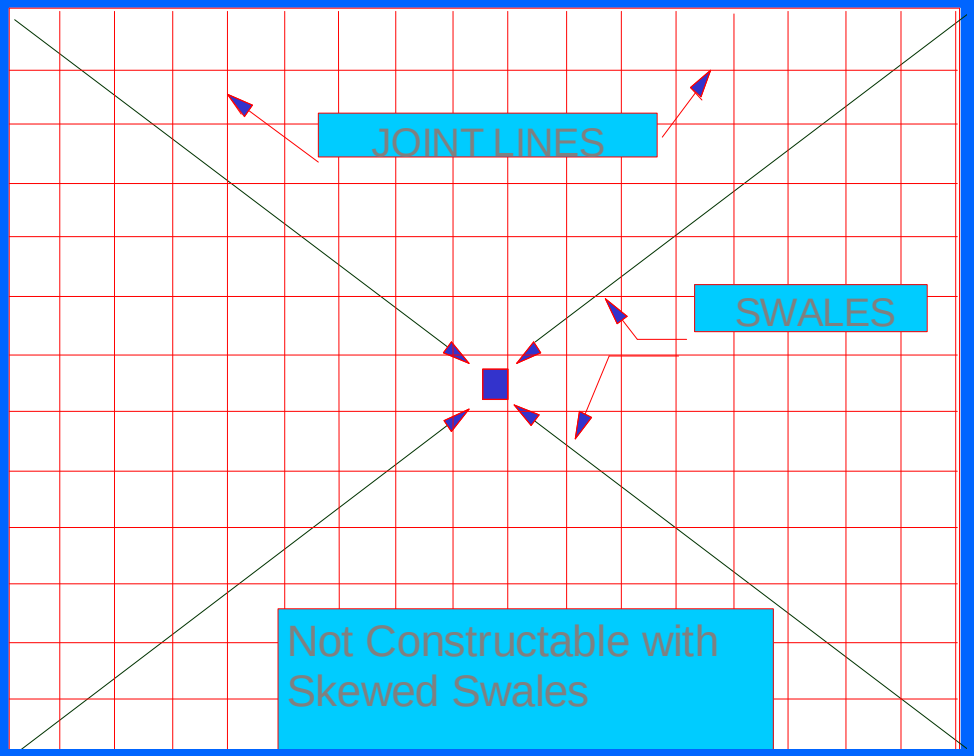
Jointing Plans



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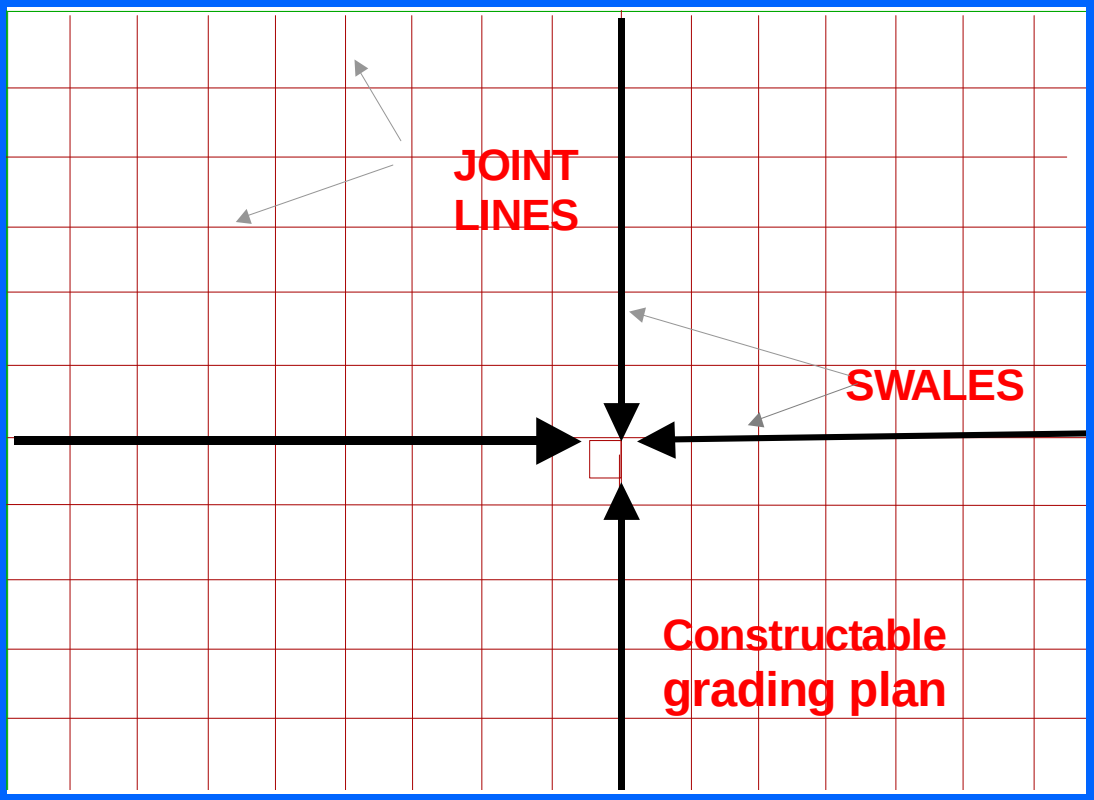
Jointing Plans



Jointing Plans

(Grades)

- **Provide Spot Elevations**
- **Joint Intersections**

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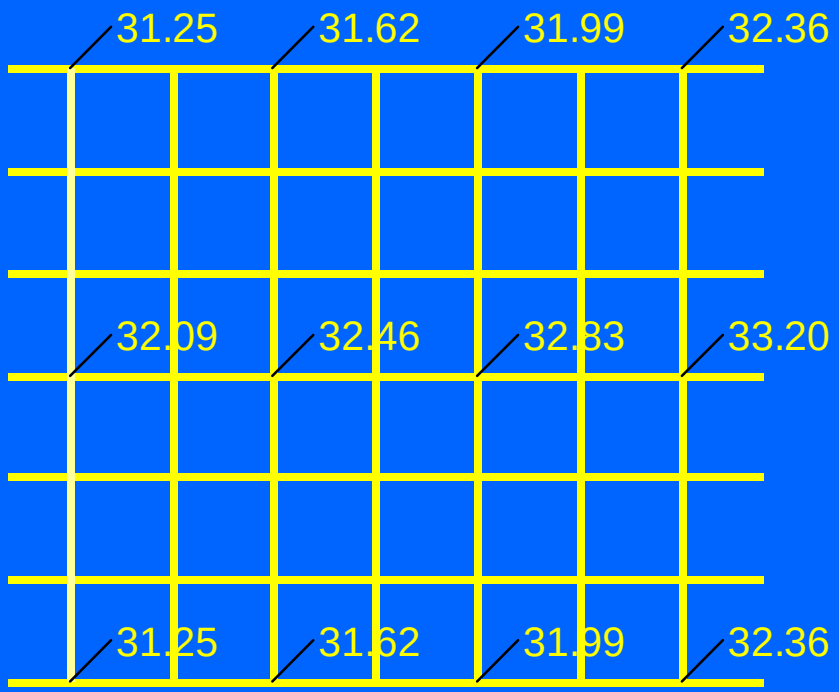
Jointing Plans

(Grades Spot Elevations)



Jointing Plans

(Large Pavement Penetrations)

- Larger than one slab
- Try to match joint spacing
- Odd shaped slabs near the penetration
- Hand placement required by structures

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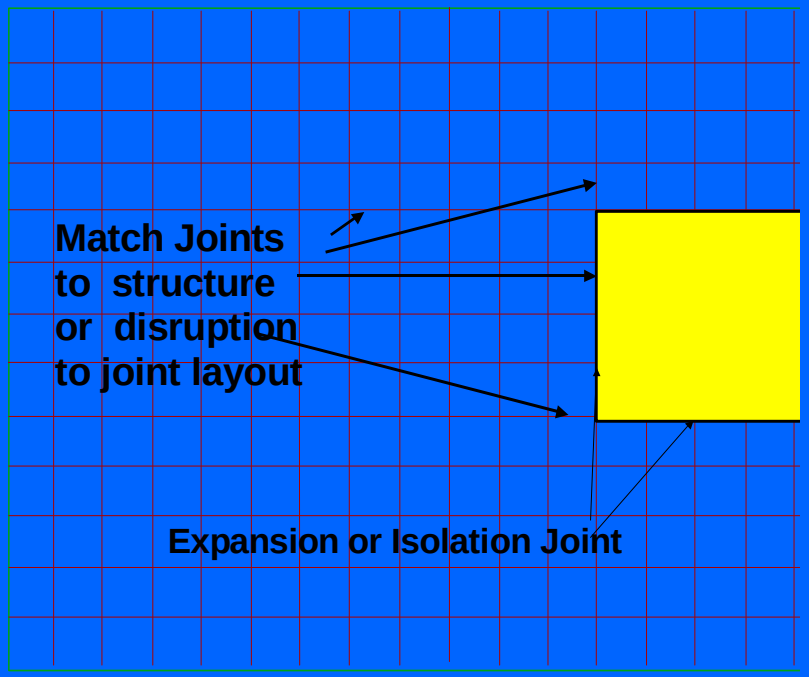
Jointing Plans

(Large Pavement Penetrations)



Jointing Plans

(Small Pavement Penetrations)

- **Smaller than one slab**
- **Interior of slab**
- **Exterior of slab**

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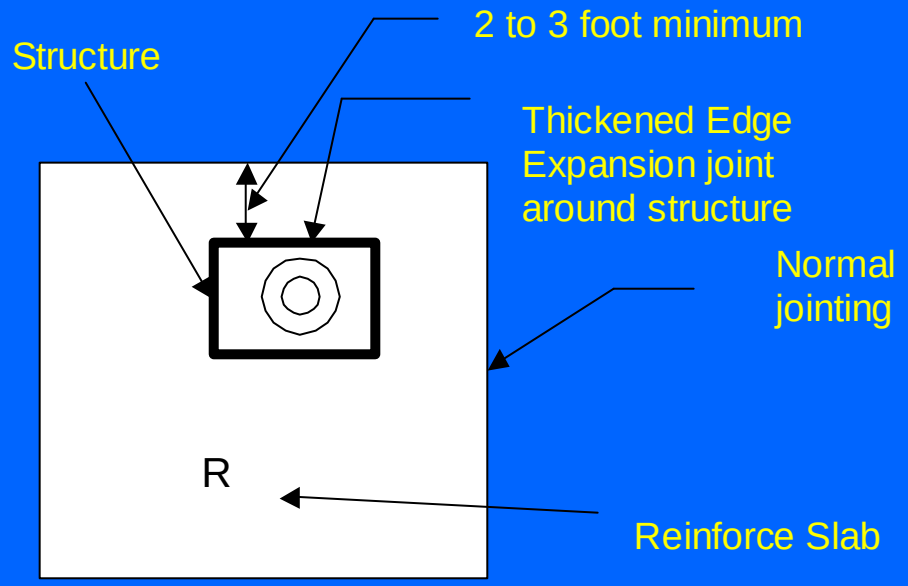
Jointing Plans

(Small Pavement Penetrations Interior preferred)



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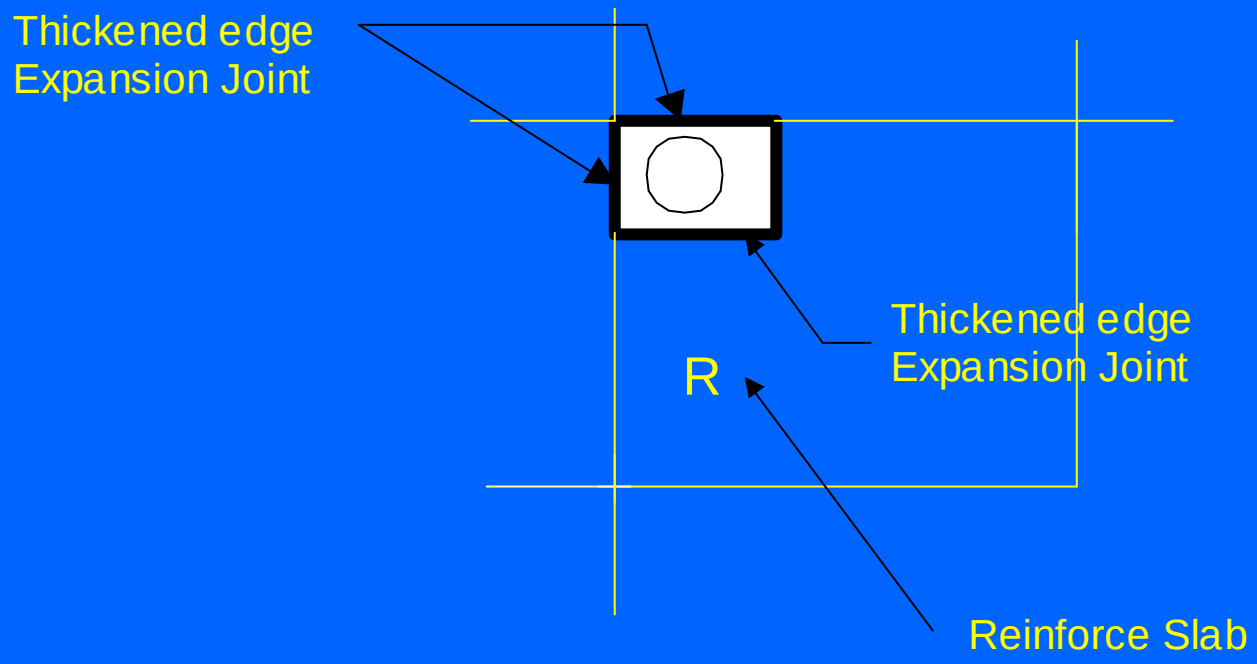
Jointing Plans

(Small Pavement Penetrations Exterior not preferred)



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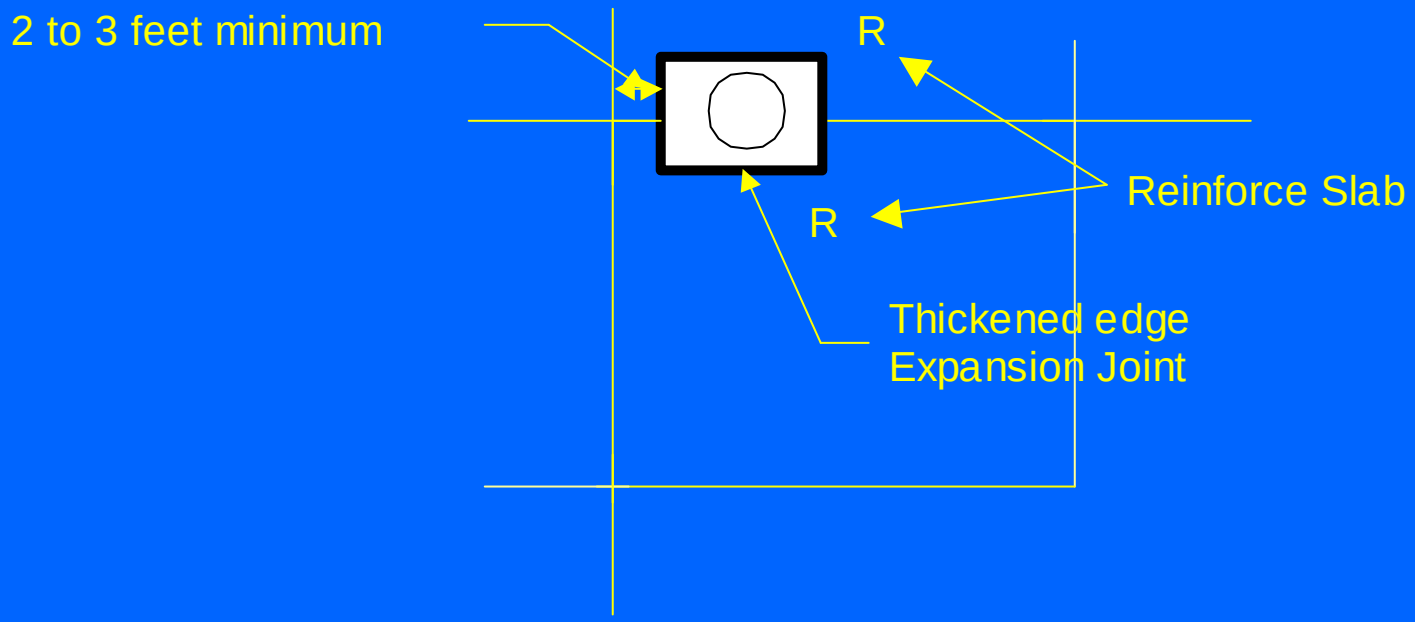
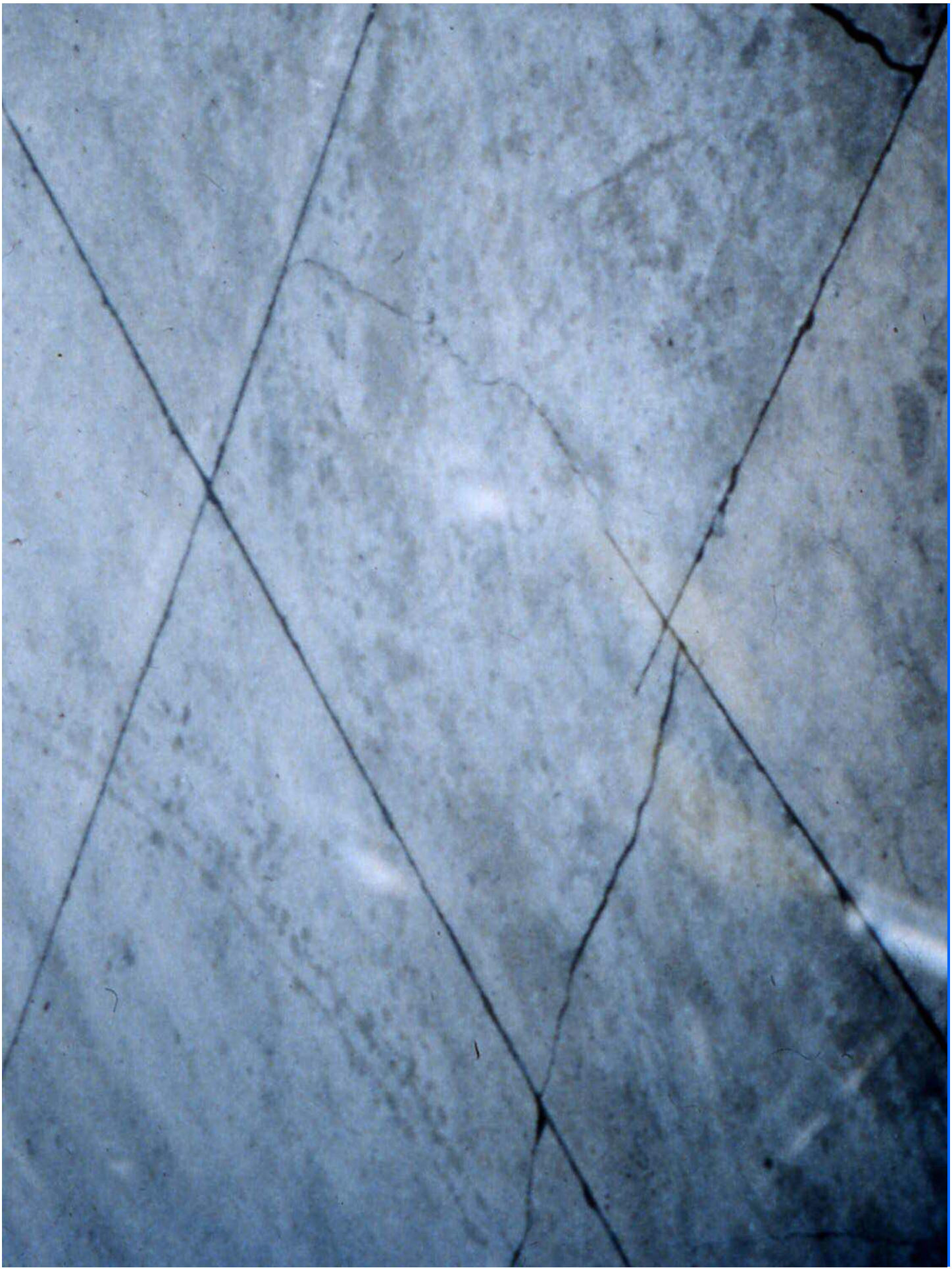
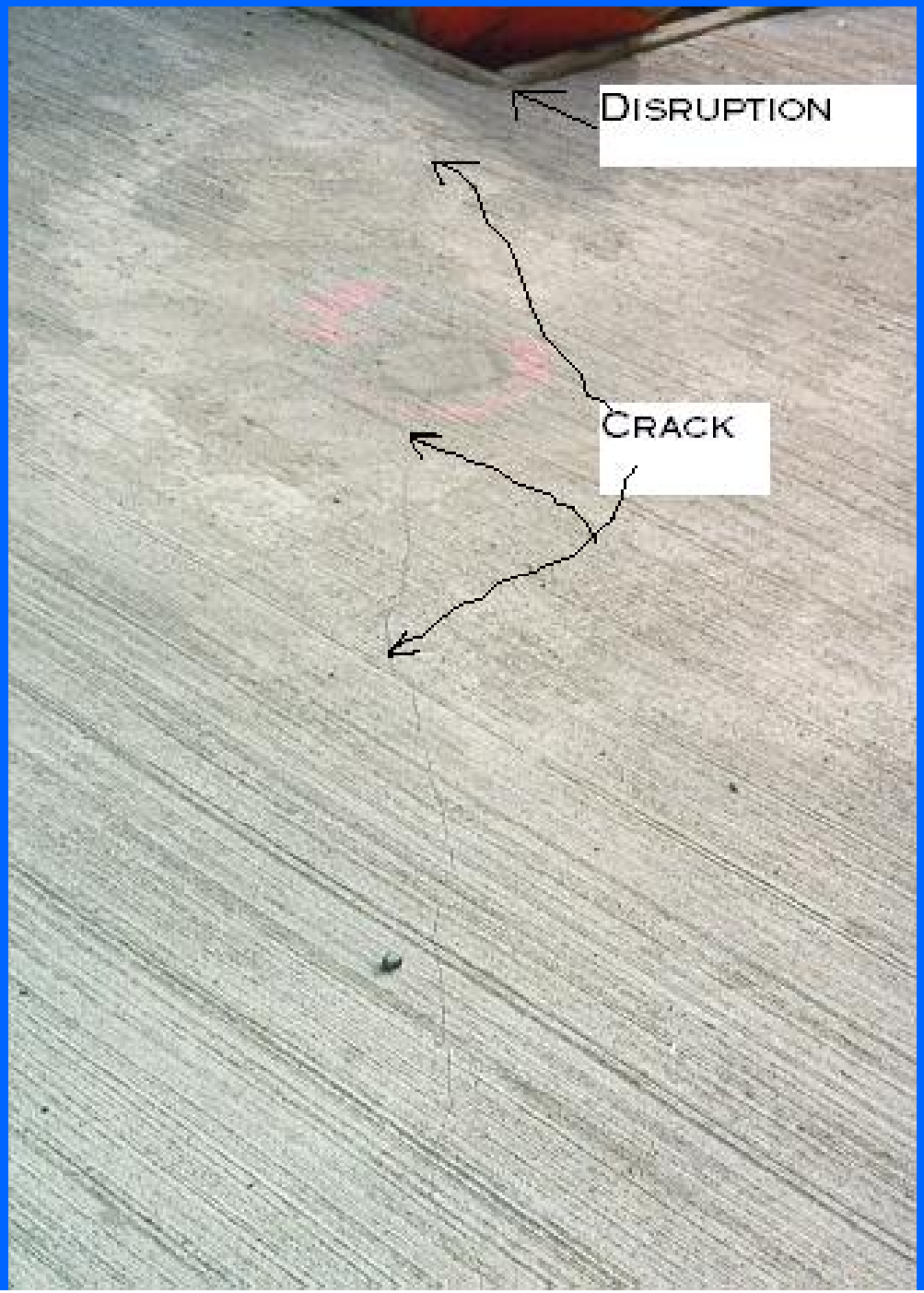
Jointing Plans

(Small Pavement Penetrations on joint not recommended)






Disruption
Crack

Jointing Plans

(Connecting Pavements)

- Mismatched Joints
- Pavement movement laterally
- Pavement expansion

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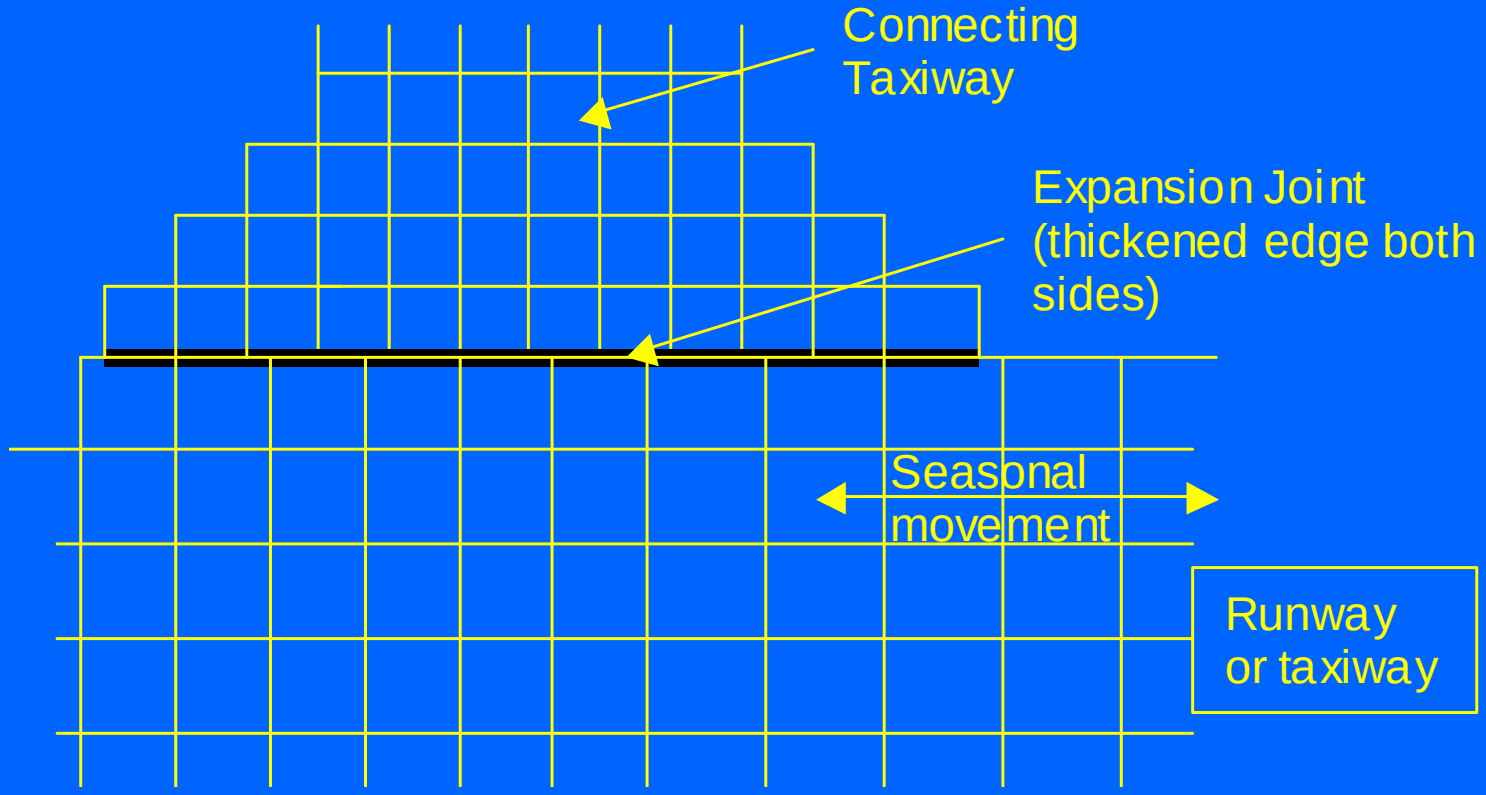
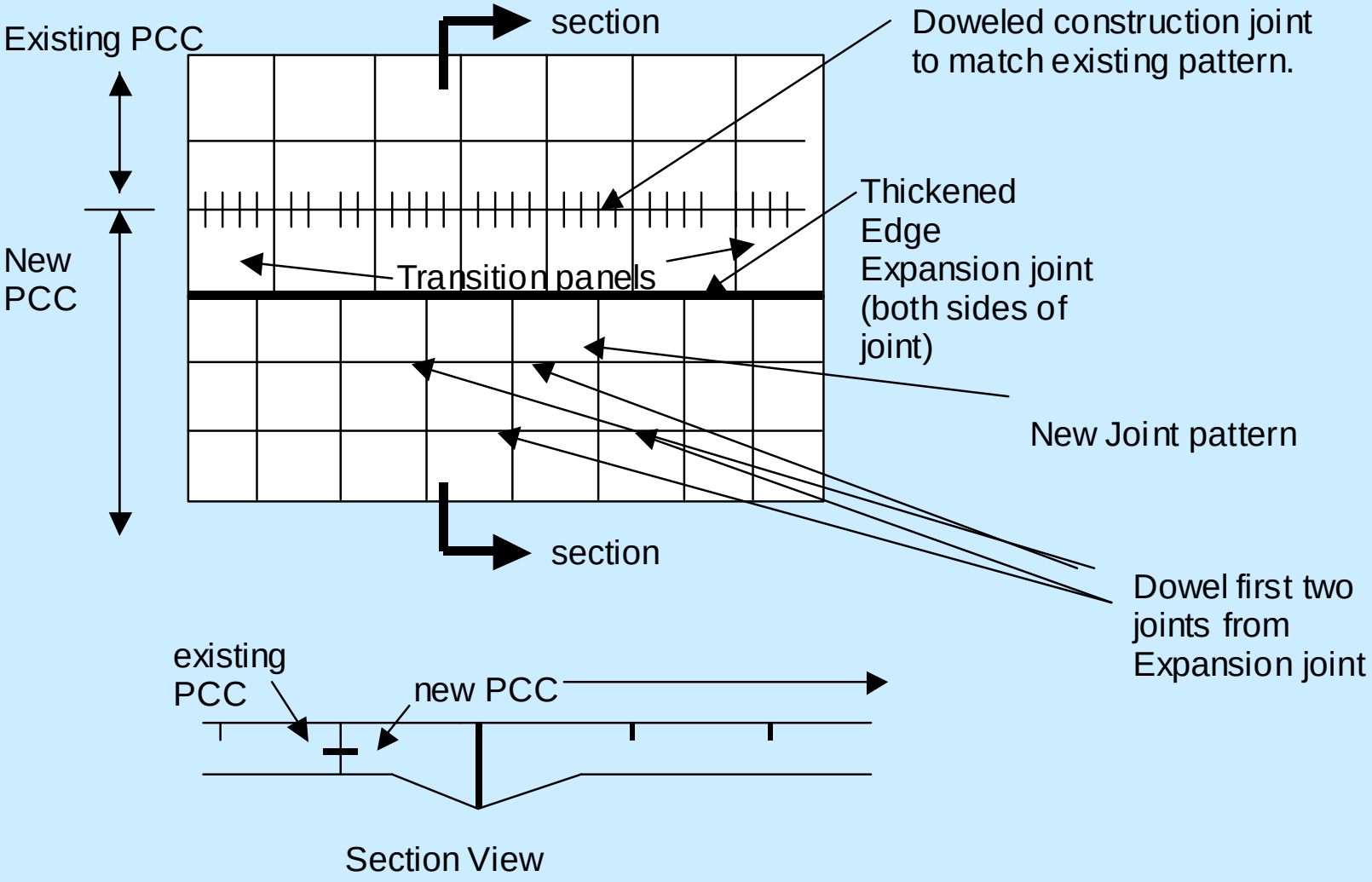
Connecting Pavements



Connecting Pavements



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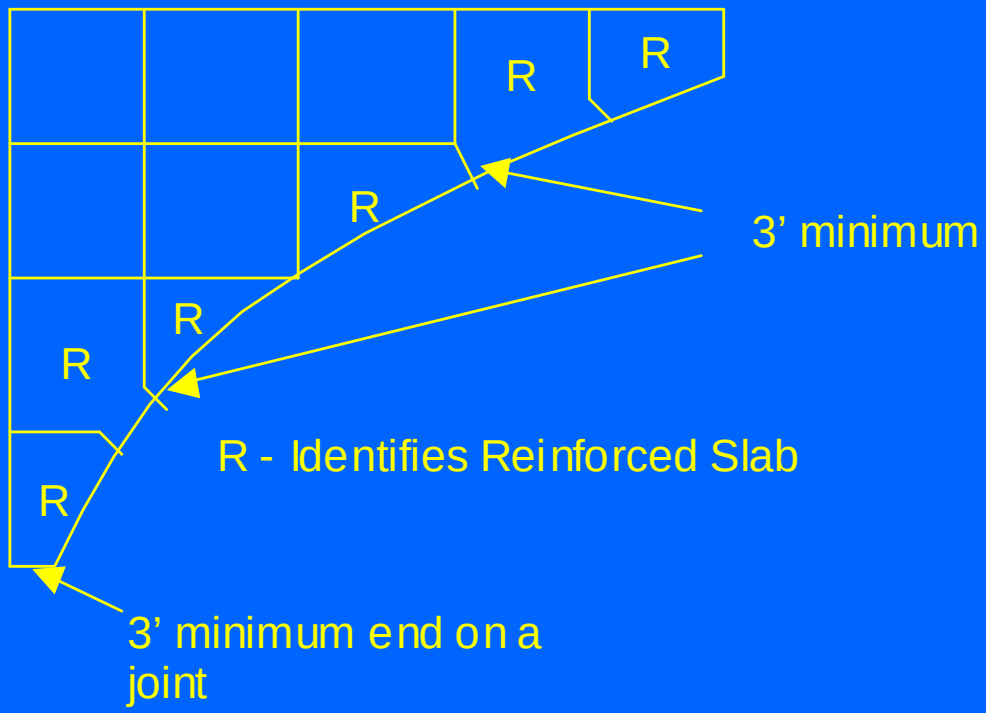
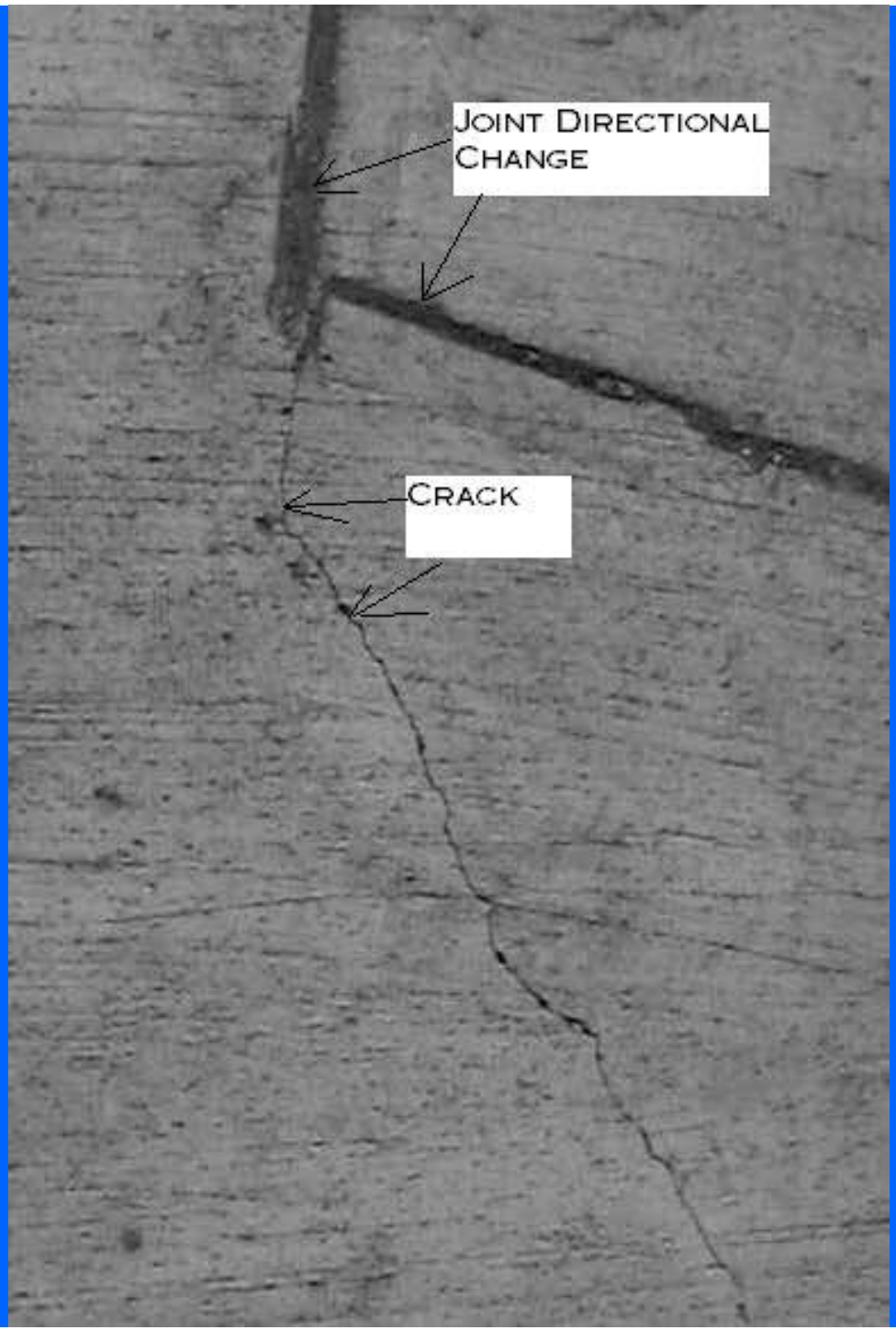
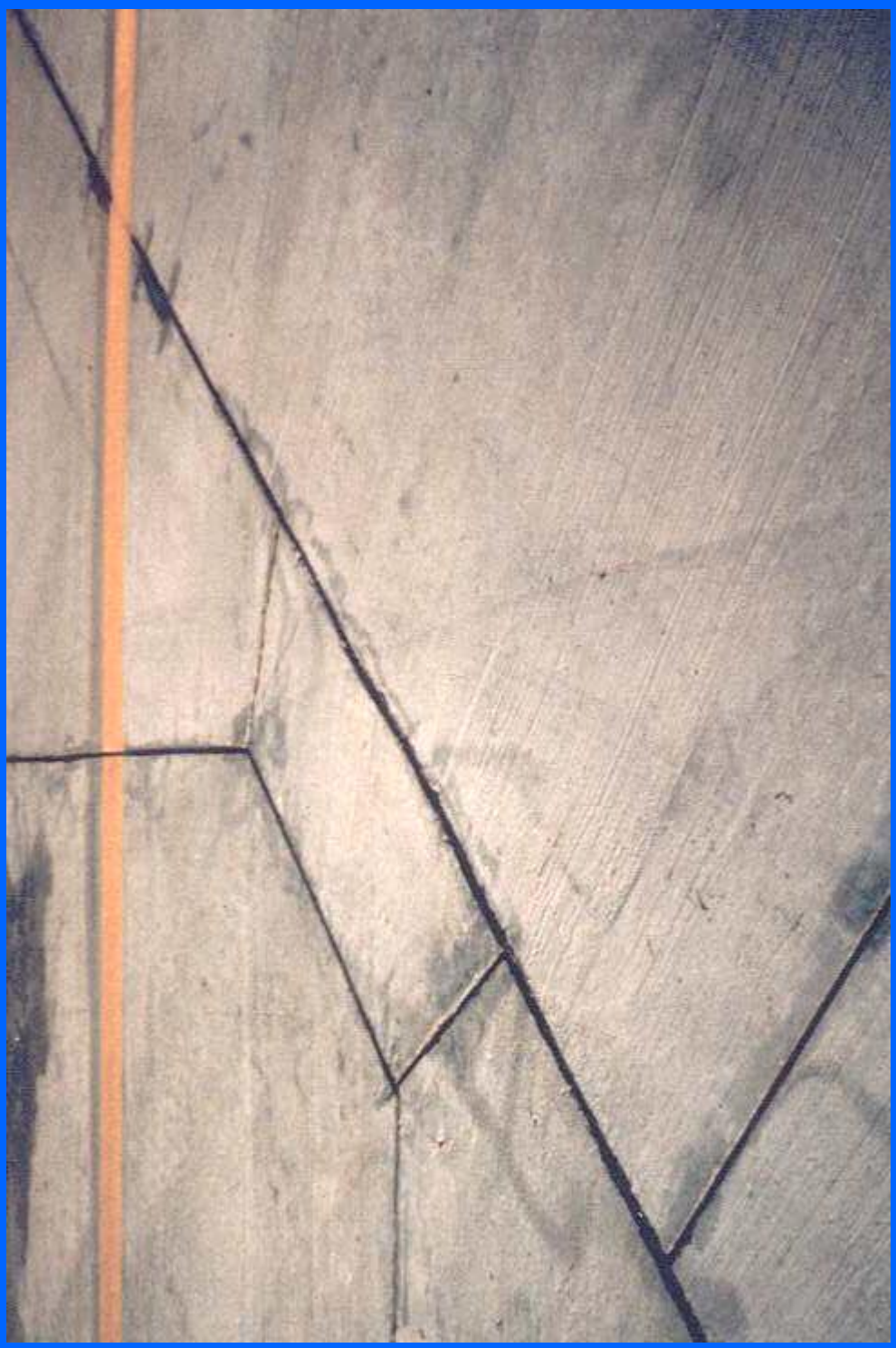
Jointing Plans

Filets/Odd Shaped Slabs




Joint Directional Change
Crack



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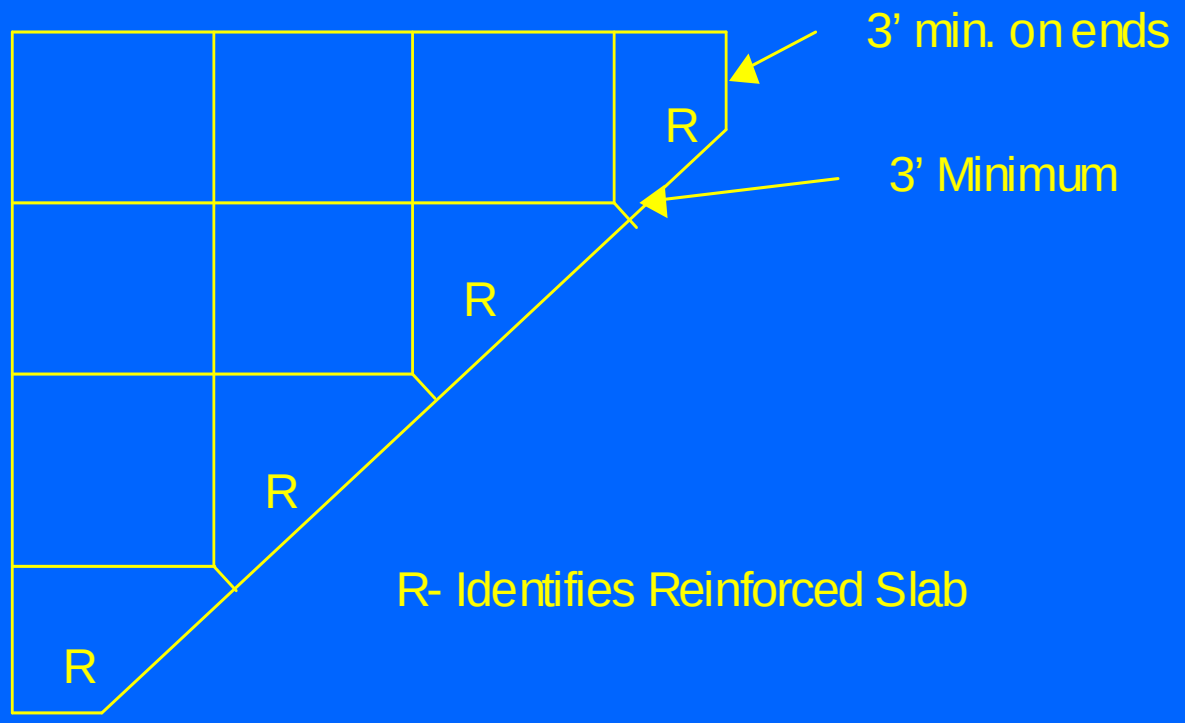
Jointing Plans

Filets/Odd Shaped Slabs



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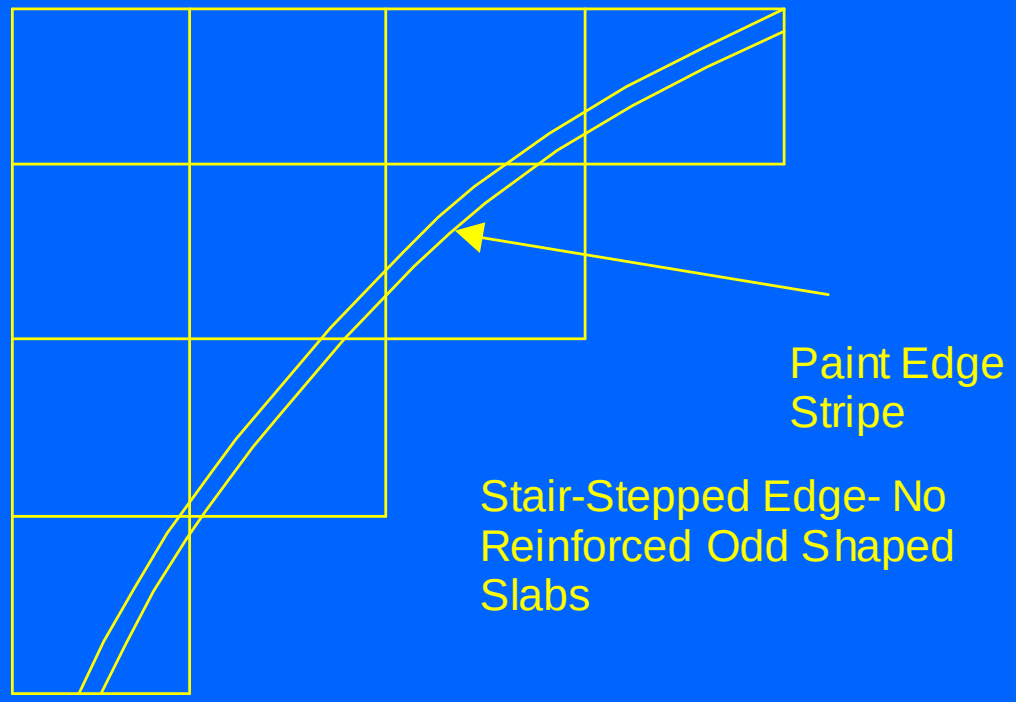
Jointing Plans

Filets/Odd Shaped Slabs



Joint Sealing Discussion

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Reasons for Sealing

- Prevent intrusion of incompressibles
- Prevent water/fluid intrusion
- Eliminate pockets for FOD buildup
- Extend pavement life

Types of Pavement Joints to Seal

- Control/contraction
- Expansion
- Construction
- Cracks

Types of Pavement Joints Sealant

- Hot Applied
- Cold Applied One Component
- Cold Applied One Component
- Preformed Compression Seal

Hot Applied

- Non-jet fuel resistant ASTM D 1190, 3405 or 3406 (old SS-S 1401)
- Jet Fuel resistant for PCC ASTM D 3569 or 3581 (old SS-S 1614)

Non-jet fuel resistant ASTM D 1190, 3405 or 3406 (old SS-S 1401)

- Recommendations: Use for asphalt pavement sealing, or at the juncture of asphalt and PCC. It is easy to use

- Disadvantages:Not recommended for PCC as bubbles form from heat and moistureNot jet blast or fuel resistant and short service life 3-5 years.

Jet Fuel resistant for PCC ASTM D 3569 or 3581 (old SS-S 1614)

- Recommendations: Use where aircraft are regularly parked, service repaired or maintained. Easy to use.

- Disadvantages: Hazardous waste material as it is coal tar based, not jet blast resistant, and short life 3 to 5 years.

Cold Applied One Component

- Meets ASTM D 5893
- Chemically Curing Silicone

Cold Applied One Component Silicone

- **Recommendations: Easy to use for both small and large jobs. Has a long life 20 or more years.**

- **Disadvantages: Damaged or destroyed by water blasting, and swells when constantly immersed in jet fuel.**

Cold Applied Two Component

- Meets SS-S 200 E
- Two components mixed in dispensing wand as it is being applied

Cold Applied Two Component

- Recommendations: Can be used in most all airfield joint sealant applications. Relatively long life and performs well in spalled joint walls for resealing

- Disadvantages: Two components require mixing and placing properly or it does not cure properly and makes a big mess.

Preformed Compression Seals

- Meets ASTM D 262
- Polychloroprene (neoprene)

Preformed Compression Seals

- Recommended for use on all new pavements, 20 + year life

- Must get the joint size correct and must have good joint walls (no spalls)

LOX Area Joint Sealant

- No sealant is truly LOX compatible.
- All exhibit explosive characteristics in LOX environment.
- Threshold values vary.

LOX Area Joint Sealant

- **Use only Approved Sealants**
- **USAF approved sealants:**
  - Poly-jet LOX, mfgr W.R. Meadows
  - Jeene
  - E-Bond 1018

Design Essentials Discussion

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Design Essentials

- Plans
- Guide Specifications
- Design Analysis
- Phasing Plans

Plans

- **UFC 3-260-02 Appendix C**
  (Plans Outline.pdf - included on CD)
- **Overview**
- **Example Plans**
  (Example Plans.pdf - included on CD)

Guide Specifications

- **UFGS Guide Specifications**
  (http://www.ccb.org/docs/ufgshome/UFGSToc.htm)
- **Editing for Review**
  (SpecsIntact Software)

Design Analysis

- UFC 3-260-02 Appendix B
  (DA Outline.pdf - included on CD)
- Overview

Phasing Plans

- UFC 3-260-01 Attachment 15
  (Phasing Outline.pdf - included on CD)
- Overview

Poor Phasing Plan??